July 2014

Draftsmen's Sketch Book for Parts for the Ford Motor Company

M. M.

4

COMPANY Ford Motor Co SKETCH B'K 2236

GEN. SUBJECT 42" & 32" Mills

USED BY M. M. BEGINNING 10/26/23 COMPLETED

ORDER NO.	SUBJECT
21109	32" Billet Mill Drive
21109	32" Roll Housing
21008	42" Roll Housing
P 22	Weight 32" Roll
P 29	Supporting Pins
	Weights of 42 & 32" Drives
	Page 1.

TO BE USED BY THE DRAFTSMAN FOR ALL SKETCHES, NOTES, CALCULATIONS AND DATA RELATING TO THE ABOVE COMPANY ONLY, UNDER NO CIRCUMSTANCES ARE LOOSE SHEETS OR PRIVATE NOTE BOOKS TO BE USED.

NO UNUSUAL EFFORT SHOULD BE MADE AT NICETY, BUT EACH ENTRY SHOULD INVARIABLY BE COMMENCED WITH THE SUBJECT AND DATE OF THE WORK, AND FULL NOTES MADE OF DATA ON WHICH CALCULATIONS ARE BASED AND THE RESULTS OBTAINED CLEARLY STATED.

BOOKS ARE TO BE ALWAYS QUICKLY AVAILABLE TO RECEIVE INSTRUCTIONS, SKETCHES AND DATA AS MAY BE GIVEN THE DRAFTSMAN AND HE WILL BE RESPONSIBLE FOR THEIR DELIVERY AT ANY TIME.

MORGAN CONSTRUCTION CO. WORCESTER MASS. ENG. DEP'T

SUBJECT .....
COMPANY ..... DATE .....

Approximate weight of
42" & 32" Drills

42" Mill

Weight of bed, bearings	
hubs & oil pans	85
Weight of shafts	18
Weight of gears	35

32" Mill

Weight of bed bearings	
hubs & oil pans	150
Weight of shafts	33
Weight of gears	66

2 Weights

SUBJECT 42" Blooming Mill

COMPANY Ford Instrs Co DATE 11/2/23

B31885 Spur gears
B31895 Spur gear Spider

Bed Spur gear Half 30,155
" Bevel gear Half 47,550

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

W 3

SUBJECT 32" Billet Mill

COMPANY Ford DATE 11/2/23

30
48
78000
40

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT 37" Dia. Hooks
COMPANY Gold Fittas DATE 10/30/23

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

99.471
120.000
90.717
310.188

310.188
234
76.188

19
12
38
19
228

310.188
76.188
234

76.188 / 2 = 38.094

234 / 2 = 79.576
51.623
27.953

99.471
38.094
61.377

90.717
38.094
51.623

84.351
61.377
22.974

22.974
61.377
84.351

51.623
27.953
79.576

23.75
99.69
21375
14250
21375
21375
2367.6375

23.75
.0781
2375
19000
16625
1.85475

90.717
1.855
88.862

88.862 / 23.6760 = 4443.10

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT
COMPANY DATE

2573 / 23.6760 = 92.017

2573
23157
51 90
51 46
4400
2573
1827 0

2391.24
9564.84

9564.84
54.756
901.728

9664
48320
47.607

9664
67648
96.64
57984

46.0080
38.656
7.35420
6.76480
.58940
.52884
.06056

2573
23157
2058.4
2573
2058.4
2573
2058.4

SUBJECT .....

COMPANY ..... DATE .....

417.976
.2574 / 107.48.70
10296
4527
2574
20530
18018
25120
23166
19540
18018
15220

2574
5
12870

2574
8
20582

47.607
.2574
180428
333249
238035
95214
12.253041 8

46.008
46.008
368064
276048 00
184032
2116.7360 64

2116.736

430.129
2 4,30.129
3871161
2 860258
430129
12903870
1720516
185010.955 1
2116.736
187127.691

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....

COMPANY ..... DATE .....

187127.691 / 432.594
16
83 / 271
249
862 / 2227
1724
864 / 503.69
42225
86509 / 81 4410
77 8581
8651 8 / 3582900

865184
44
3460736

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

8445
5
42225

8446
6
50676

86509
9
77 8581

488.594
488.594
1954336
3 439 7346
2 44 2970
3 908752
3908752
1954336
238720.096.796

19'-6"
12
38
19
228
6
234

234
234
936
702
468
54756

489
489
4401
3912
1956
239121

SUBJECT Dam

COMPANY DATE

238144
14 4
952576
54756
897820

488
418.113
70.881

5'-10.881"

417.976
3 .9664
1671904
2507856
2507856
3761784
40393200064

897820 | 947.533
81
184 | 878
736
1887 | 14220
13209
18945 | 101100
94725
189503 | 637500
568509
68991

1887
7
13209

488
418.166
69.834

947
2
1894

18945
5
94725

488
418.166
69.834

69

5'-9

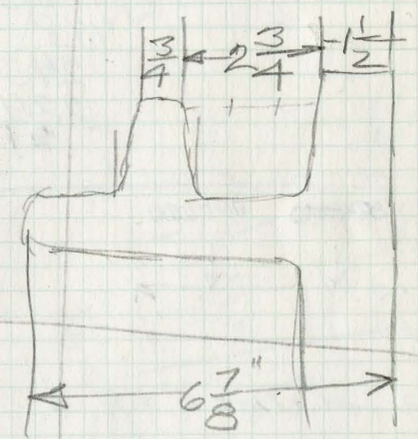
417.976
3.9664
1671904
2507856
2507856
3761784
40393700064

SUBJECT

COMPANY DATE

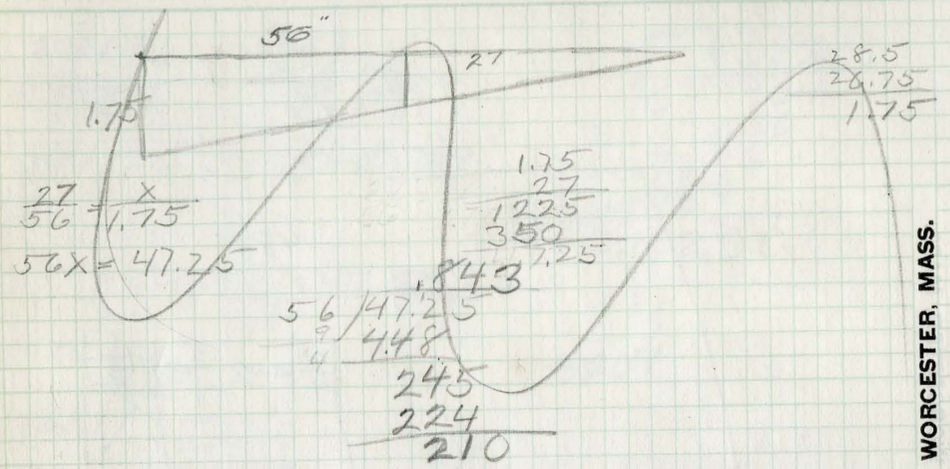
473.766
14.234
488000

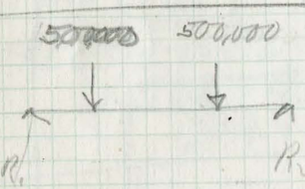
488



.875
7
2.625

SUBJECT Span Gas Casing (Intermediate Section)
COMPANY Ford Motor Co. DATE 11/9/23





R = 500,000

max shear = $R_1 = R_2 = \frac{500000}{10000} = 50$ sq in

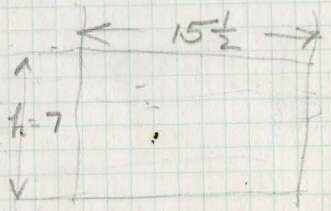
$M = \frac{(500,000)(2\frac{1}{2})}{4} = 1,250,000$ "-lbs.

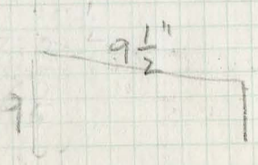
$\frac{1,250,000}{10,000}$ $\frac{1}{c} = 125$ 312,000

$125 = \frac{b h^2}{6}$

$750 = b\,49$

$b = 15\frac{1}{2}$

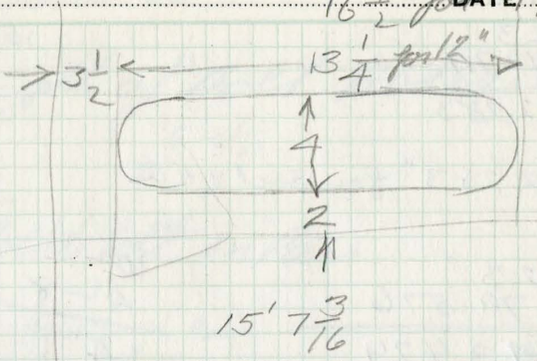




$750 = b\,81$

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT
COMPANY DATE

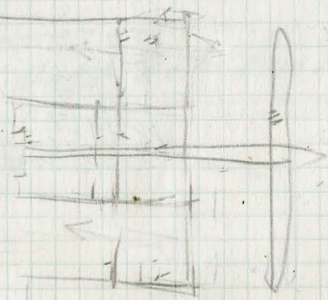


15/12
30

500,000
1,250,000

117.86
113.10
476

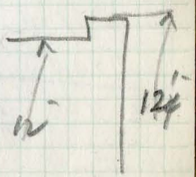
3 7/8
6
5'
2 3/4
1 1/8
1



24000 =
5

13 1/8"

118
113.
5



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY..... DATE.....

123
@0.717
32.283

32.283" for 3rd & 4th

123
79.576
43.424

43 1/2 32 1/4

10'-3
4'-8
14' 11
2' 1 3/4
12 9 1/4

28.5 - 26.75 / 1.75

1 - 1.75/56 = X/34.75

34.75
1.75
17375
24325
3475
60.8125

56X = 60.8125 / 1.086
X = 56 / 481 / 448 / 332 / 336

1 1/16"

56
25 3/4
30 1/4

5'-0 1/2
15'-7 3/16
13'-4 15/16
2 1/4"

15'-7 3/16"
-2'-6 1/4
18'-1 7/16"

26 1/4" difference / 2 = 13 1/8"

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Oil Pans 32" Mill
COMPANY Ford Motor Co DATE 12/13/23

Over all length of Bolt Holes 3 4 Pan

19'-0" 6'-1 1/4
12'-2 1/2
31'-2 1/2 = Bolt to bolt on Pan

12'-9 1/4 for 3rd Pair
18'-1 7/16" for 4th Pair
30'-10 11/16".

30'-14.5
30'-10.6875
2) 3.8125 = difference both ends
1.90625
= 1 29/32"

Over all length of Bolt Holes 1 & 2 Pan

19'-0" 5'-0 1/8
10'-0 1/4
29' 0 1/4" Bolt to Bolt on Pan

12'-9 1/4" for 3rd Pair

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY..... DATE.....

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

$10'-3$
$2\ 6\frac{1}{4}$
$12\ 9\frac{1}{4}$
$1\frac{7}{8}$
$12'-11\frac{1}{8}$

$15\frac{1}{8}$
$152\frac{1}{4}$
$2\frac{7}{8}$

56
$25\frac{3}{4}$
$30\frac{1}{4}$"

15
12
30
15
180

14
13
42
14
182
18
$11\frac{1}{8}$
$211\frac{1}{8}$

$8\frac{1}{4}$
18
126
$152\frac{1}{4}$

$15'-7\frac{3}{16}$
$187\frac{3}{16}$"
$30\frac{1}{4}$
$217\frac{7}{16}$"
$211\frac{1}{8}$
$5\frac{5}{16}$
$1\frac{7}{8}$
$7\frac{3}{16}$

18
7
126

19
12
38
19
228

56
9
65

$144\frac{1}{8}$
$155\frac{1}{8}$

1

$187\frac{3}{16}$
$30\frac{1}{4}$
123
$30\frac{1}{4}$
$370\frac{11}{16}$
358
$12\frac{11}{16}$
$3\frac{3}{4}$
$2\,|16\frac{7}{16}$
$8\frac{1}{4}$"

228
65
293
65
358 ~~4 nut end bolt.~~

$17\frac{7}{8}$

358
$16\frac{1}{2}$
$374\frac{1}{2}$ = overall bolt dimensions

SUBJECT .....
COMPANY..... DATE.....

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

14
$\frac{1}{8}$
$11\frac{2}{8}$
18
$8\frac{1}{8}$
$16\frac{4}{8}$
$155\frac{1}{8}$ = overall for 1163 Pair.

$18-3\frac{3}{8}$
$12\,|219\frac{3}{8}$
99
96

182
18
$8\frac{1}{4}$
$208\frac{1}{4}$

$219\frac{3}{8}$
$208\frac{1}{4}$
$11\frac{1}{8}$

14
13
42
14
182
18
$11\frac{1}{8}$
$8\frac{1}{4}$"
$219\frac{3}{8}$
$155\frac{1}{8}$
$374\frac{1}{2}$

182
18
$11\frac{1}{8}$
$12\,|211\frac{1}{2}$ (17
91
84
$7\frac{1}{8}$

$187\frac{3}{16}$
$30\frac{1}{4}$
$217\frac{7}{16}$

$219\frac{3}{8}$
$217\frac{7}{16}$
$1\frac{15}{16}$

24
36
$60 = 5'$

$5'0"$

$7'-7$
$4'-4$
$16'11$

$6'-3\frac{1}{8}"$
$5\frac{1}{2}"$
$6'8\frac{5}{8}$

$15'-7$
$1'-4$
$16\ 11$

176
30
5280

176
16
1056
176
2816

96
8
968

$10\frac{3}{4}$
$8\frac{3}{8}$
$2\frac{1}{8}$

2816
968
160
300
4244

5280
968
160
300
6708

$8,000$
$480,00$

480

SUBJECT .....

COMPANY ..... DATE .....

$10\frac{3}{4}$
$1\frac{15}{16}$
$8\frac{13}{16}$

10.75
1.9375
8.8125

15
12
30
15
180

15
$10\frac{3}{4}$
$25\frac{3}{4}$
$187\frac{3}{16}$
$212\frac{15}{16}$

15
12
30
15
180

3
21
22
29
65
18
$56\ 8\frac{1}{4}$
$219\frac{1}{4}$

14
4
56

$187\frac{3}{16}$
$30\frac{1}{4}$
$218\frac{7}{16}$

13
5
65

$56\ 25\frac{3}{4}$
$30\frac{1}{4}$

$58\frac{1}{4}$
14
14
14
14
18
13
13
13
13
29
11
11
21
$219\frac{1}{4}$

15
$10\frac{3}{4}$
$25\frac{3}{4}$

$56\ 25\frac{3}{4}$
$30\frac{1}{4}$

$10'-3$
$2\ 6\frac{1}{4}$
$12'\ 9\frac{1}{4}$

$153\frac{1}{4}$"
$155-\frac{1}{8}$
$153-$
$2"\frac{7}{8}$

$217\frac{7}{16}$
$219\frac{1}{4}$
$\frac{3}{16}$
$219\frac{1}{4}$ $\frac{4}{16}$ 20
$217\frac{7}{16}$
$1\frac{13}{16}$"

$3\frac{1}{16}$
$2\frac{1}{8}$

$15'-7\frac{3}{16}$
$2\ 6\frac{1}{4}$
$18-1\ 1$
$1630\frac{1}{4}$

18
12
36
1
216
$+17\frac{1}{16}$

31
65
18
$42\ 9\frac{1}{8}$
$155\frac{1}{8}$

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

28

SUBJECT Weight of 33" pin Oil Run

COMPANY Zadd Nitro Co DATE 10/25/23

length = 228"

$\frac{48}{28}$
76

$(76 \times 228 + 24 \times 228) \times .28$

17300 + 5475
5475
22775 cubic in.

$\frac{22775}{.28} = 6,375$ $3\frac{1}{4}$ tons

20

11.6875
6.6428
5.0447

198
396 | 303
396 | 120000
1189
1100

3030

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Ford Motors

COMPANY DATE

dia is ~~slight~~ for 3 R.P.M. worm drive

33,000 / 10

330,000 ft lbs.

12

660000

33 0000

3,960,000 in lbs

$P = 2\pi$

$d = \sqrt[3]{\frac{(321,000)(10)}{(3)(7500)}}$

$d = \sqrt[3]{\frac{3,210,000}{22\,500}}$

$d = \sqrt[3]{14.3}$

$d = 2.5$

.9997
.25
49985
19994
.249925

$\frac{2.67\pi}{2} = 1.338$

2.75
2.426
.324

300
324
2676

dia screw = 3"

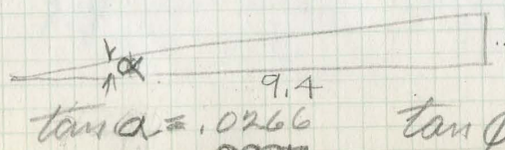
R. mean Radius = 1.338

α = angle of Pitch =

β = angle between flanks = 60°

W = weight = 14,000 lbs

ϕ = angle of friction = .25



$\tan\alpha = .0266$ $\tan\phi = .25$

$\cos\alpha = .9997$

.0266
9.4).250
188
620
470
0

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT

COMPANY DATE

$F = \frac{W_R}{a}\left(\frac{\tan\phi\cos\alpha}{\cos\frac{\beta}{2}} + \tan\alpha\right)$

$F = \left(\frac{14000}{8}\right)\left(\frac{(1.25)(.9997)}{.866} \times .0266\right)$

$F = \left(\frac{18700}{8}\right)\left(\frac{.2499}{.866} \times .0266\right)$

$F = \left(\frac{18700}{8}\right)(.2885 \times .0266$

$F = (2337.5)(.0768)$

$F = 179.4$ lbs

8
8
16.1

50" / 4 = 200

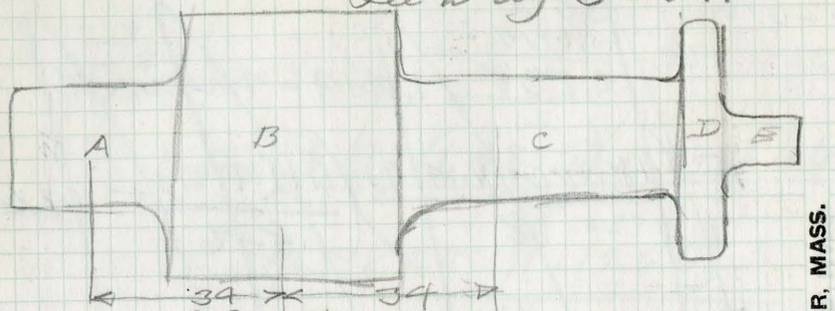
90
200) 18000

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Weight of 42" Roll

COMPANY DATE

Lee Drug B31891



Weight of A = 2590#

Weight of B = 15,500#

Weight of C = 3,520

Weight of D = 2,280#

Weight of E = 917#

24,807

Weight of A Dia = 21 length = 26 3/4

Area = 346.5

346.5 X 26.75 X .28 = 2590# = Weight of A

Weight of C Dia = 21" length = 36 1/4

346.5 X 36 1/4 X .28 = 3520#

Weight of B

Mean Dia = 41" length = 42

1320 X 42 X .28 = 15500#

Weight of D

1818 X 8 X .28 = 2,280

Weight E

13 X 9 X 14 X 2 X .28 =

13 / 14 / 52 / 13 / 182 / 9 / 1638

1638 / 2 / 3276 / 28 / 26208 / 6552 / 9172.8

28665 / 68 | 1949200 / 136 / 589 / 544 / 452 / 408 / 440 / 408 / 320

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

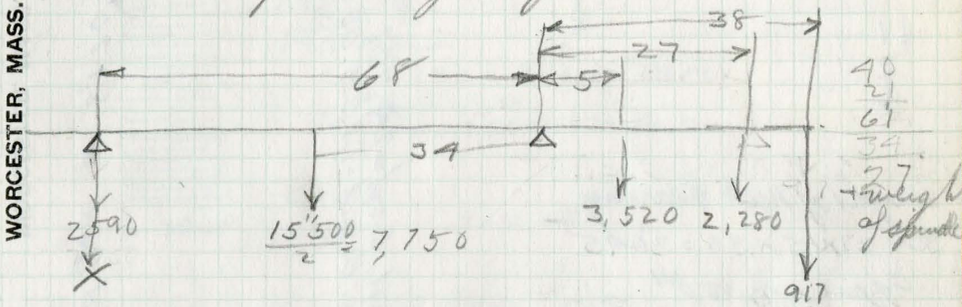
SUBJECT

COMPANY DATE

Total weight = 24807

24807 / 2 = 12,403

12403 − 2590 (weight of A) = 9803 to find length of B which = 9803



34 X 15,500 + 68 X 2590 + 68 X =

38 X 8,957 + 27 X 2,280 + 5 X 3520.

527,000 + 176,100 + 68X = 340,500 + 61,500 + 17,600

+17600 — 340500 / 61500 / 17600 / 419,600

527000 / 176100 / 703,100

703,100 + 68X = 419600

68X = −283500

X = 4170 lbs.

24807 / 4170 / 20707

8040 / 106 / 4824 / 8040 / 852240

15500 / 34 / 62000 / 46500 / 527000

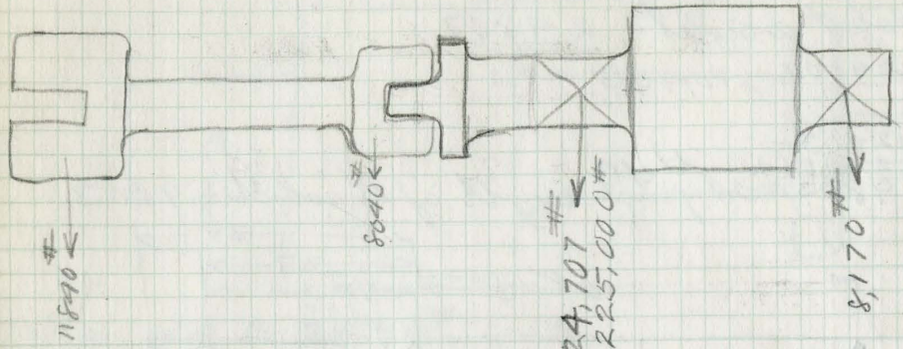
917 / 206 / 5502 / 18340 / 188902

917 / 106 / 5502 / 9170 / 97202

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Roll Loads

COMPANY Ford Motor Co. DATE 12/28/23



Weight of neck bearing
30 x 27 x 15 x .30 = 3645 #
Appox 4,000 #

20 707	4170
4 000	4000
24 707	8170

Live Load = 1,200,000 / 25,000

24 707
3645
28,352 / 2 = 14,176

Pitch L = 2

29.8 / 29.8 = tan α = 1

29.8) 1000 (.03
894
1060

SUBJECT Adjusting Screw

COMPANY Ford Motor Co. DATE 12/28/23

Mean radius = 4.75" Pitch = 1"
Assume 3 R.P.M.

Mean dia = 9½" circum = 29.8

29.8 / 3 = 9.9" Per min

25,000 x 3 = 75,000 "# Per MIN

75,000 / 12 = 6,250 FT LBS Per min.

6.250 / 1875.0 = 1/3 X = 2,500

$F = \frac{(25000)(4.75)(.3 + .0336)}{12}$ lever arm.

$F = \frac{(188,000)(.3336)}{12}$

$F = \frac{62,700}{12}$

F = 5,220 #

18.18 x 5,220/12 = 93,300 # lbs per min

25,000 / 7500.0 = .3 / 37,500 ft lbs. = .5

$K = \frac{r}{\sqrt{2}} = \frac{4.5}{1.41} = 3.2$

(3)(2π 3.2) = 60.5 / 12 = 5 ft.

93300
37500
130,800

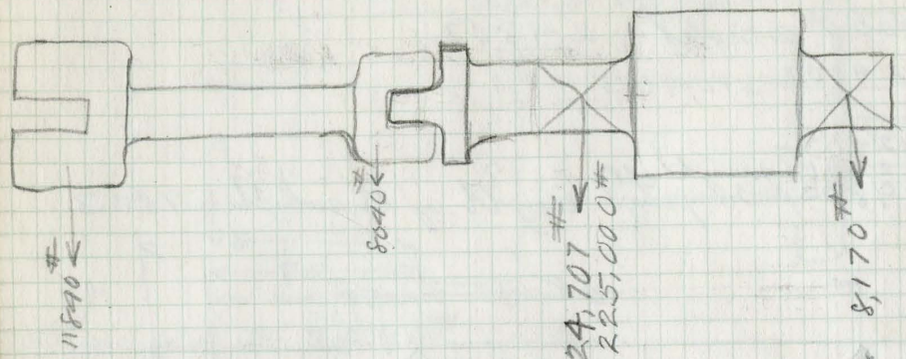
130,800 / 33000 = 4.18 H.P.

4.18 HP Required to raise screw 3" in 1 Minute

See P 27

SUBJECT Roll Loads

COMPANY Ford Motor Co. DATE 12/28/23



Weight of Neck bearing

30 x 27 x 15 x 30 = 3645 #

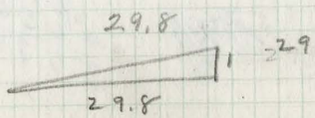
Approx 4,000 #

20 707	4170
4 000	4000
24 707	8170

Live Load = 1,200,000 / 25,000

24 707
3645
28,352 / 2 = 14,176

Pitch L = 2



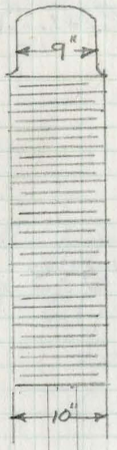
29.8) 1000 .03
891
1060

$\tan \alpha = \frac{1}{29.8}$

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Adjusting Screw

COMPANY Head Masters DATE 12/28/23



Mean radius = 4.75" Pitch = 1"

Assume 3 R.P.M.

Mean dia = 9½" circum = 29.8

29.8 / 89.4" Per min

25,000 x 3 = 75,000 "# Per MIN

75,000 / 12 = 6,250 FT LBS Per min.

6.250 .3 / 1875.0 X = 2,500

$F = \frac{(25000)(4.75)(.3 + .0336)}{12}$ lever arm.

$F = \frac{(188,000)(.3336)}{12}$

$F = \frac{62,700}{12}$

F = 5,220 #

18.8 x 5,220 / 12 = 93,300 # lbs per min

25,000 .3 / 7500.0 .5 / 37,500 ft lbs. 60

$K = \frac{r}{\sqrt{2}} = \frac{4.5}{1.41} = 3.2$.

(3)(2π 3.2) = 60.5 / 12 = 5 ft.

93300
37500
130,800

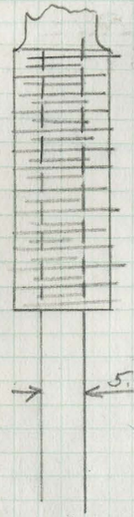
130,800 / 33000 = 4.18 H.P.

4.18 HP Required to raise screw 3" in 1 minute

See P 27

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY ..... DATE .....



Adj Screw shaft,
To transmit 10 HP at 3 R.P.M. Fibre stress 7,000

$$d = \sqrt[3]{\frac{(321,000)(10)}{(3)(7000)}}$$

$$d = \sqrt[3]{\frac{3,210,000}{21000}} = \sqrt[3]{153}$$

$d = 5.34"$

130,800 ft. lbs per min

18.9 ft per min = 7300 lbs

7,300 lbs at end of 12" lever arm.

$P \times R = S \times Z_p$

$7300 \times 12 = 7,000 \times .08 d^3$

$87,500 = 560 d^3$

7000 × .08 = 560.00

$d^3 = \frac{87500}{560} = 157$

$d = 5\frac{1}{2}"$ = corrected sq shaft

SUBJECT .....
COMPANY ..... DATE .....

$\frac{1,225,000}{63}$ See mark P292

$$63 \overline{)1225000} \quad 19,400$$

63
595
567

$M = \frac{1}{2} f L D$

$M = \frac{1}{2}(.3)(24,707)(9)$

222,200 × .3

66,660.0

$\frac{66,660.0}{2} = 33,330$

$M = 33,330$

$2\pi MN$ = work expended in in lbs.

$(18.85)(33,330)$

628,000 inch lbs per min

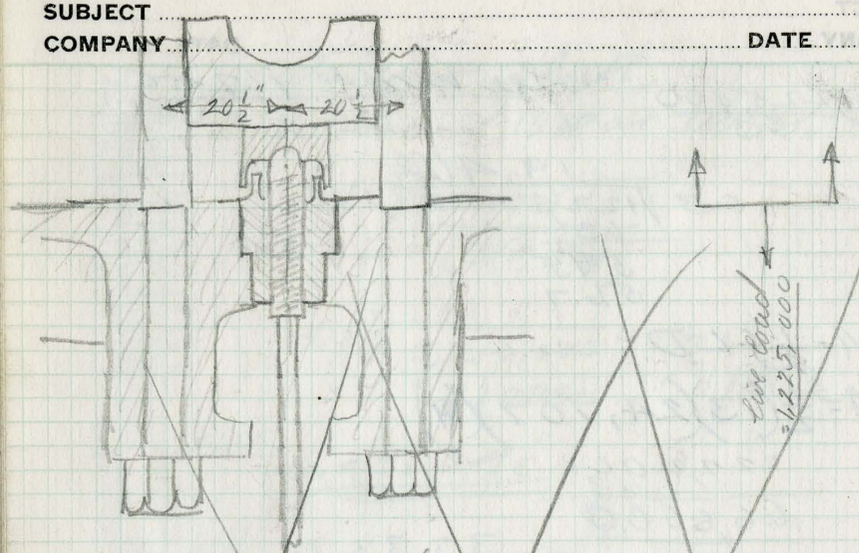
52300 ft lbs per min

33,000

= 1.58 H.P. absorbed by hemispherical pivot

63.5
28.25
3525

SUBJECT
COMPANY DATE



Max bending moment = $\frac{WL}{4}$

$\frac{(1,225,000)(41)}{4}$

$\frac{50,225,000}{4}$ = 12,556,250 "# = B.M.

$\frac{12,556,250}{2000}$ = 6278 required section mod

$I = 6278 = \frac{bh^3}{12} = \frac{(18)(110592)}{12} = \frac{1990658}{12}$

$I = 166000$

48 x 18 = 864 □"

See Page 31

110592 / 12 / 884738

1990658 / 12 / 884738

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT
COMPANY Ford Motor Co. DATE

Top Roll Supporting Pins

Load on each pin = $\frac{28352}{2}$ = 14,176 #

Assuming pins 1½" dia. Then limit compression per sq inch = 8,000 lbs per sq in.

$R^2 = .5620 \times \pi = 1.77$ sq in

$\frac{14,176}{1.77} = 8,000$ lbs

Ratio of slenderness

36" = Length

Radius of gyration $= K = \frac{R}{\sqrt{2}} = \frac{.75}{1.41} = .53$"

$\frac{36}{.53} = 68$

$P = \frac{50,000}{1 + \frac{L^2}{18,000}} \cdot \frac{50,000}{1 + \frac{1,116}{18000}} = \frac{50,000}{1.62}$

= 30800 # □"

$\frac{30,800 \times 3.14}{6} = \frac{96800}{6} = 12,800$

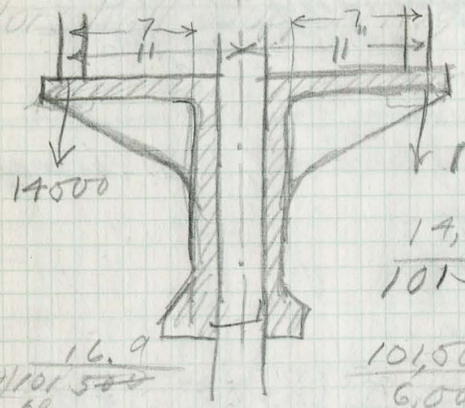
safe bearing sq in 12,800 lbs

Actual load per sq in 8,000 lbs.

By Gordon Formula

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY Jack Motor Co. DATE 1/11/24



14,500
101500 inch lbs.

$\frac{101,500}{6,000} = 16.9$

16.9
6000/101500
60
415
366
58

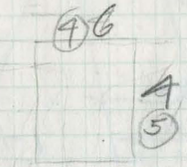
$\frac{I}{C} = 16.9$

$\frac{bh^2}{6} = \frac{b16}{6} = 16.9$

$b16 = 101.4$

$b =$

$b25 = 101.4$
$b = 4$



1240000
41
1240000
49600000
50,840,000

8473
1500 / 12710000
12000
7100
6000
11000
10500
5000

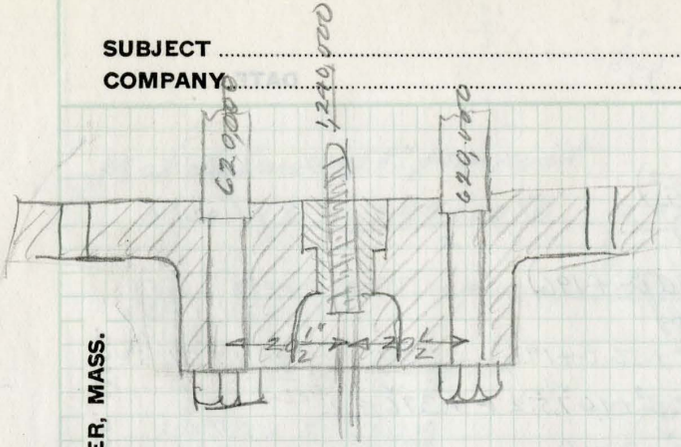
165
2304 / 38130
2304
15090
13824
12660

2304
6
13824

220
2304 / 50838
4608
4858
4608
2500

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY ..... DATE .....



Max bending moment = $\frac{Pl}{4}$

$M = \frac{(1,240,000)(41)}{4} = \frac{50,840,000}{4}$

$M = 12,710,000$ "#

$\frac{I}{C} = \frac{12,710,000}{1,500} = 8473$ = section modulus

stressed to 1,500 #□"

$\frac{I}{C} = \frac{bh^2}{6} =$

$8473 = \frac{b2304}{6}$

$2304b = 50838$

$b = 22$

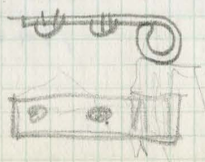
$\frac{I}{C} \quad \frac{12710,000}{2000} = 6,355$ = section modulus

stressed to 2000 #□"

$6,355 = \frac{b2304}{6}$

$2304b = 38130$

$b = 16.5$



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT

COMPANY DATE

$$\frac{I}{C} = \frac{t_1^2(b^2 + 4bb_1 + b_1^2)}{12(b_1 + 2b)}$$

$$6{,}355 = \frac{19.2}{12}\cdot\frac{(b^2 + 56b + 196)}{(14 + 2b)}$$

$$6355(14 + 2b) = 19.2(b^2 + 56b + 196)$$

$$88970 + 12710b = 19.2b^2 + 1075.2b + 3763.2$$

$$-19.2b^2 + 11635b + 85207 = 0$$

$$x = \frac{-11635 \pm \sqrt{135{,}378{,}225 + 6{,}543{,}896}}{-38.4}$$

$$x = \frac{-11635 \pm \sqrt{141{,}922{,}121}}{-38.4}$$

$$x = \frac{-11635 \pm 11913}{-38.4}$$

$$38.4x = 11635 \pm 11913$$

$$38.4x = 23548$$

$$x = 613$$

$$x = 7.2$$

$$\frac{1{,}240{,}000}{9{,}920{,}000} \quad 8$$

$$2486$$

$$2000 \overline{)14{,}960{,}000}$$

$$\begin{array}{r} 4000 \\ 9608 \\ 8000 \\ 16000 \\ 16000 \end{array}$$

$$141922121 \overline{)11913}$$

$$\begin{array}{r} 1 \\ 21\overline{)41} \\ 21 \\ 229\overline{)2092} \\ 2061 \\ 2381\overline{)3121} \\ 2381 \\ 23823\overline{)74021} \\ 71469 \end{array}$$

$$\begin{array}{r} 196 \\ 19.2 \\ \hline 392 \\ 1764 \\ 196 \\ \hline 3763.2 \end{array}$$

$$\begin{array}{r} 12710 \\ 1075 \\ \hline 11635 \end{array}$$

$$\begin{array}{r} 88970 \\ 3763 \\ \hline 85207 \end{array}$$

$$\begin{array}{r} 11635 \\ 11913 \\ \hline 23548 \\ 11913 \\ 11635 \\ \hline 278 \end{array}$$

$$\begin{array}{r} 11635 \\ 11635 \\ \hline 58175 \\ 34905 \\ 69810 \\ 11635 \\ 11635 \\ \hline 135,378,225 \end{array}$$

$$\begin{array}{r} 135,378,225 \\ 6,543,896 \\ \hline 141,922,121 \end{array}$$

$$\begin{array}{r} 85207 \\ 19.2 \\ \hline 170414 \\ 766863 \\ 85207 \\ \hline 1635974.4 \\ 4 \\ \hline 6,543,896 \end{array}$$

$$\begin{array}{r} 19.2 \\ 2 \\ \hline 384 \end{array}$$

$$\begin{array}{r} 23823 \\ 3 \\ \hline 71469 \end{array}$$

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT

COMPANY DATE 1/2/27

M at distance of 8" from post

$$M_x = \frac{WX}{2} = \frac{(1{,}240{,}000)(8)}{2} = \frac{9{,}920{,}000}{2} = 4{,}960{,}000$$ #

$$\frac{I}{C} = \frac{4{,}960{,}000}{2{,}000} = 2{,}480 = \text{section modulus}$$

$$\frac{I}{C} = \frac{bh^2}{6} = \frac{b2304}{6}$$

$$2480 = \frac{b2304}{6}$$

$$2304b = 14880$$

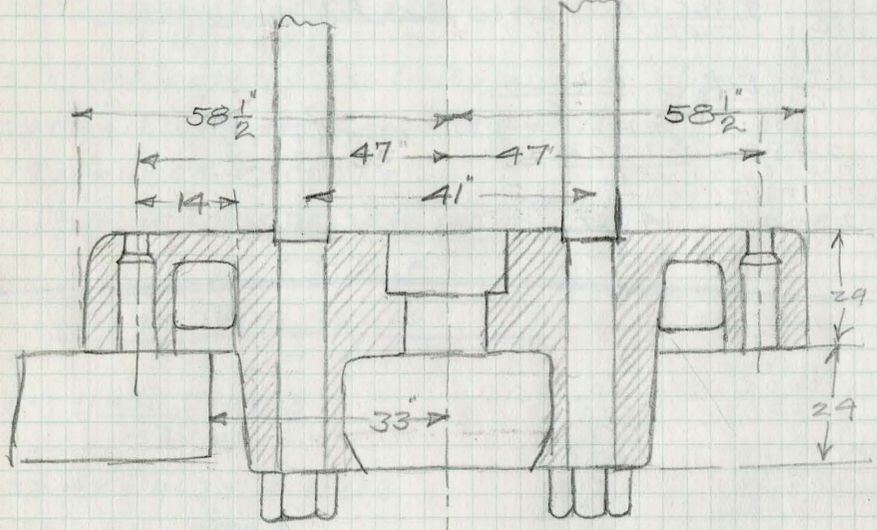
$$b = 6.5$$

$$2304 \overline{)14880} \quad 6$$

$$13824$$

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT
COMPANY Ford Motor Co. DATE 1/3/23

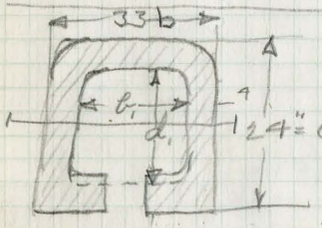


TNS. 4" bolt = 99700#

99700
2
199700#

199,400 × 14 = 2,791,600"#

2,791,600 / 2000 = 1,395.8 = I/c = section modulus



$$S = \frac{bd^3 - b_1 d_1^3}{6d}$$

$$S = \frac{(33)(13824) - (25)(4096)}{144}$$

$$S = \frac{445{,}192 - 102{,}400}{144}$$

$$S = \frac{342{,}792}{144} =$$

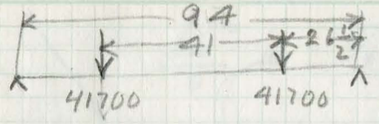
S = 2,380

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

29 × 6 × 144
13824 × 33
40472 × 40
445,192 − 102,400 = 342,792

40 × 4096 × 25 × 20480 × 8192 = 102400
445192 − 102400 = 342792

SUBJECT
COMPANY DATE 1/3/23



M = W × a
M = 41700 × 26½
M = 1,105,000"#

$$S = \frac{1{,}105{,}000}{2000} = 552$$

Weight of guides per stand 8,000

caps 2	5000
4 lock nuts	4800
cap cover	6500
4 posts	33200
end cover	3000
Neck bearings	14600
Bed	30000
2 Rolls	49200
	166800#

166800# / 2 = 83400#

83,400# / 2 = 41,700

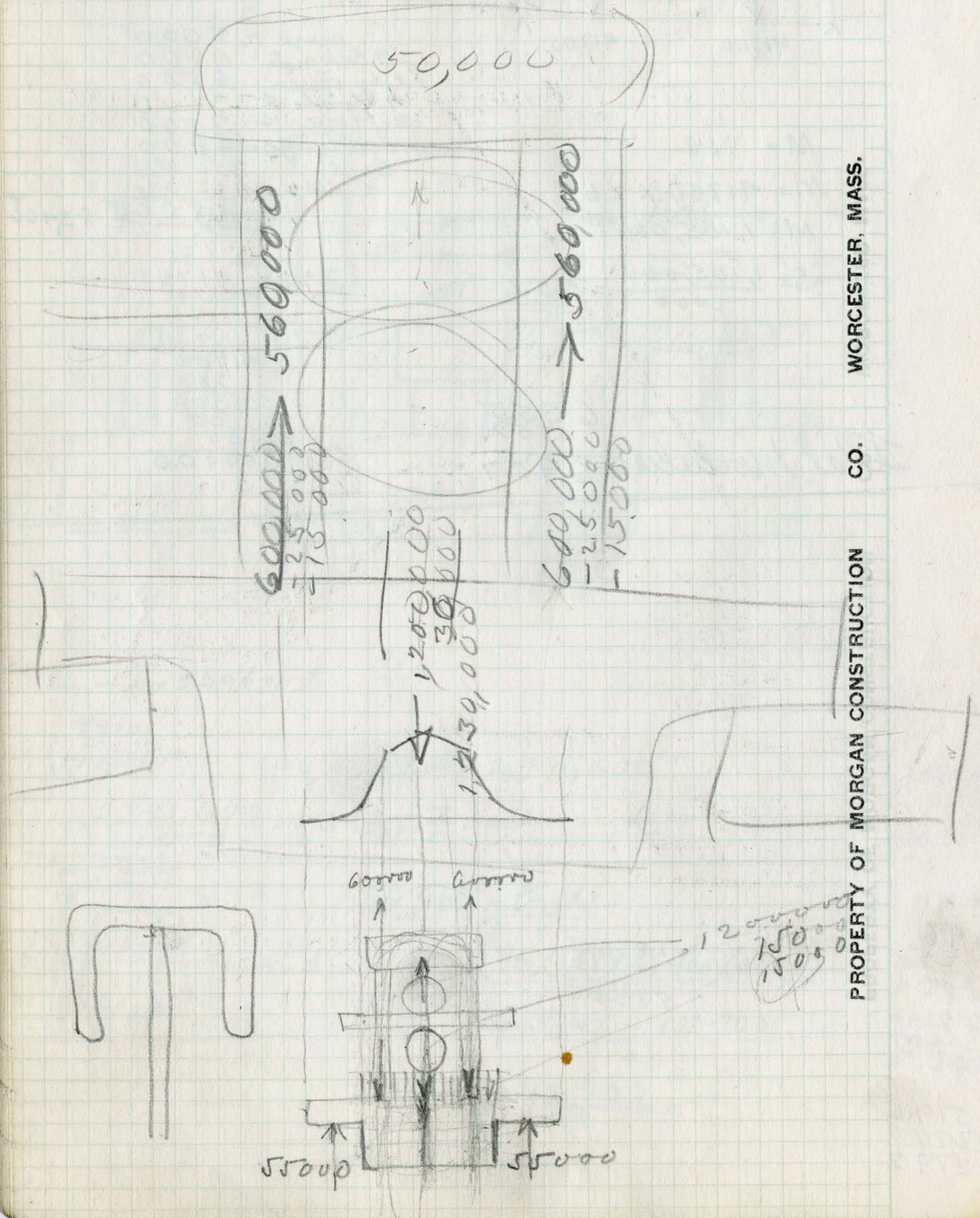
41700 × 265 × 208500 × 250200 × 83400 = 1,105,050.0

6355 × 552 = Total Modulus = 6,907

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

28665 × 2 × 57330

SUBJECT .....
COMPANY..... DATE.....



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY..... DATE.....

$\frac{bh^2}{6}$ = Sum T

$32 \times 48^2 - (18 \times 10^2 + 18.6 \times 10^2 + 16 \times 3^2 - 12 \times 25^2)$

$32 \times 2304 = 73800$

1800 +
1350
144
7500

18×400 — 1800
7200
9000
25
360

14×13^3
1200
2800
2800
30800

15000
72000
73800
25
2950

$\frac{38.5 \times 48^2 - 13.5^3 \times 48^2}{19.5}$

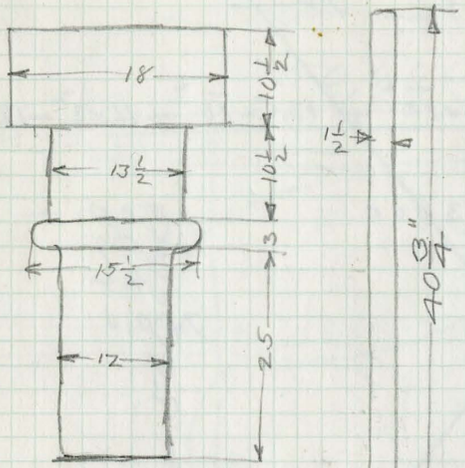
$19 \times 48^2 = \frac{43800}{6} = 7300$

33

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....

COMPANY ..... DATE .....



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT Weight of Bed

COMPANY Sand Plastas Co. DATE .....

804.25
210
594.25 ft"
196.5
791 ft"

791 × 48 = 38018

17.
283.5
87
196.5

38018
9108
47126
94252
41472
1357.22

16½
3
1 48 1½

40
49½
36
60½
12
198 ft"
6
1188
792
9108

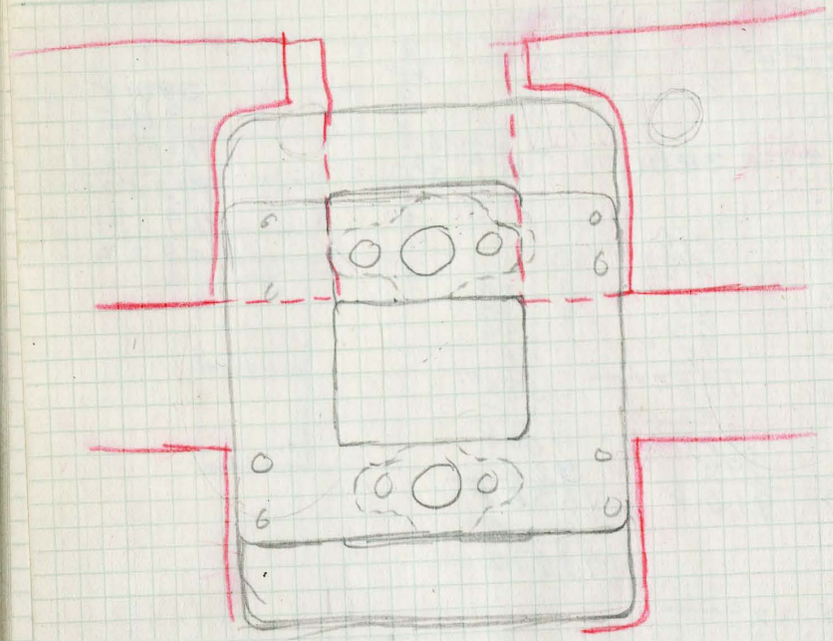
24
24
96
48
576"
18
4608
576
10368
9
41472

1357.22 cu in.
.3
407 16.6

40716 #
20 tons

PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT ..... DATE .....
COMPANY .....



SUBJECT .....
COMPANY ..... DATE .....

10 H.P. 72" Column

18 gal per min

330,000 = 10 HP per Min

18,300# = tooth pressure

W = spfy

$18{,}000 = (8{,}000)(1.5)(.112)(f)$

12,000

$18000 = f\,1345$

14.9

3

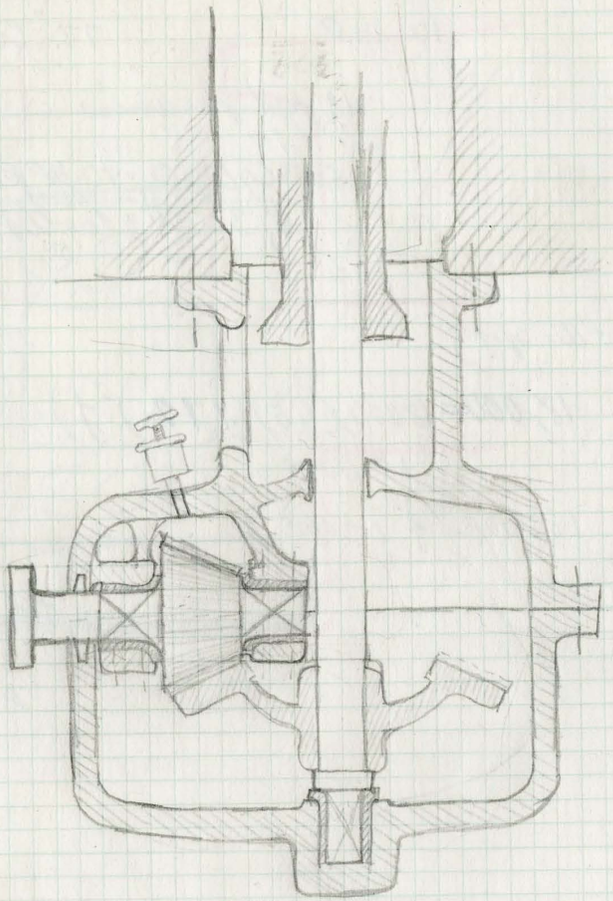
11,000, 44.7

A 90,000"#

A 900 ft lbs

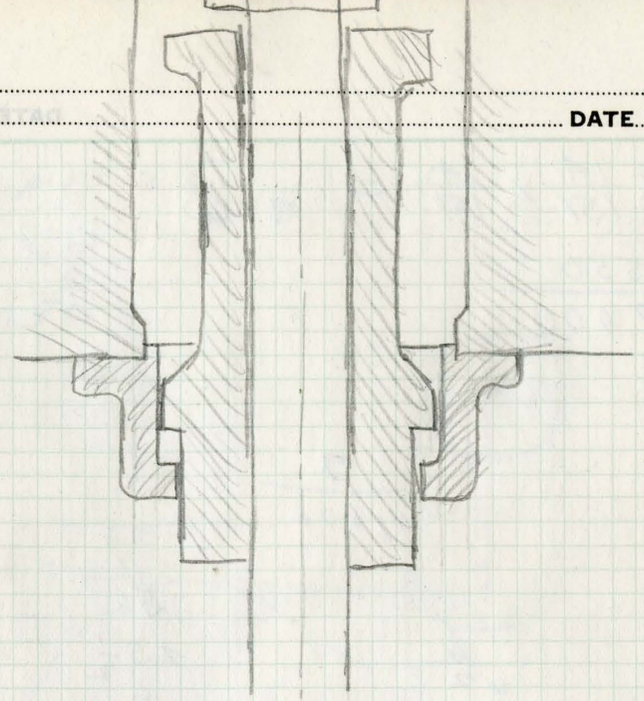
SUBJECT .....

COMPANY ..... DATE .....



SUBJECT .....

COMPANY ..... DATE .....



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

196

SUBJECT .....

COMPANY..... DATE.....

$\frac{13}{40} \times \frac{14}{151} \times \frac{14}{151} = \frac{1}{376}$

$\frac{2550}{912,000}$

151

$\frac{9}{11,000}$

27
6
162

26
6
156
25½
6
150
9
159

154

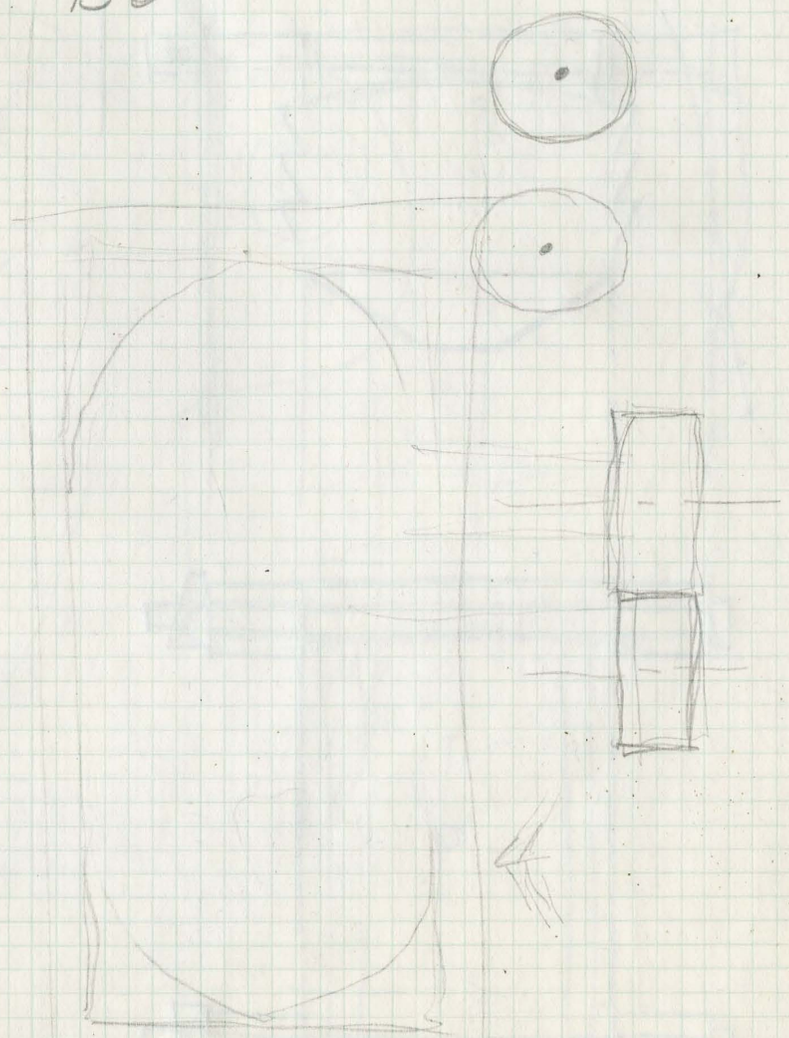
PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....

COMPANY..... DATE.....

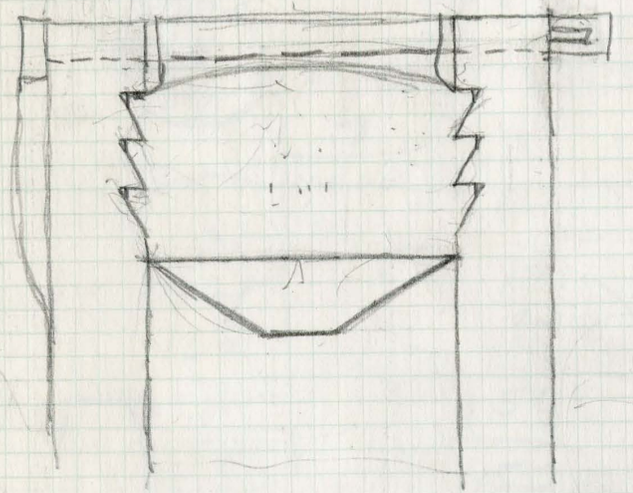
p17 25

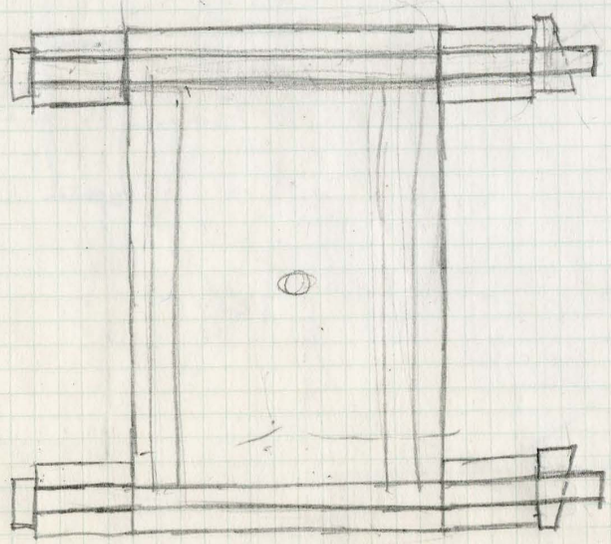
25
6
150

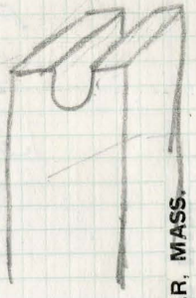


PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY..... DATE.....



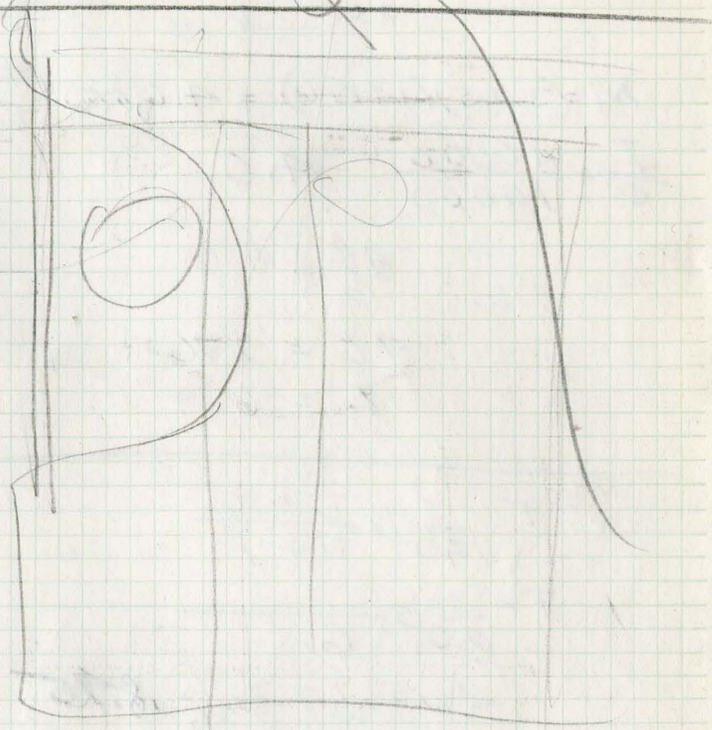




PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....
COMPANY..... DATE.....

Add Mates on Dwg A33121



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.

SUBJECT .....

COMPANY ..... DATE .....

14176

3.25 ↓

for shear $\frac{14176}{10,000} = 1.4176$ □"

$M = (3.25)(14176) = 46{,}000$ "#

$\frac{I}{C} = \frac{46000}{10000}$ 4.6

$\frac{4b}{6} = 4.6$

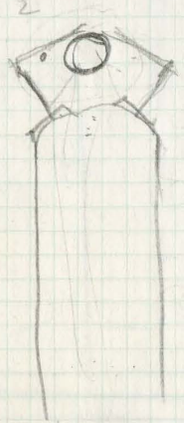
$4b = 27.6$

$b = 6.9$

$T = \frac{3}{20} D \frac{D+2}{D+1}$ 4

$T = \left(\frac{3}{20}\right)5\left(\frac{7}{6}\right)$

$\frac{3}{20} \times \frac{5}{1} \times \frac{7}{6} \quad \frac{35}{40} = 18.75$



PROPERTY OF MORGAN CONSTRUCTION CO. WORCESTER, MASS.